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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,771	01/14/2004	Zheng Yuan	007443/P2	5494

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EXAMINER	
BREWSTER, WILLIAM M	
ART UNIT	**PAPER NUMBER**
2823	

DATE MAILED: 05/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

H·A

Office Action Summary	Application No.	Applicant(s)	
	10/757,771	YUAN ET AL.	
	Examiner	Art Unit	
	William M. Brewster	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8-13,17-20 and 23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-6 and 8* is/are allowed.

6)☒ Claim(s) *9-13,17-20 and 23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 9, 10, 17-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Thakur, US Patent No. 5,474,955.

Thakur anticipates:

limitations from claim 9, in fig. 3, a method of forming a silicon oxide layer 26 on a substrate 10, comprising: providing a flow of a silicon-containing processing gas to a chamber housing the substrate, not specified, but necessary to contain the reactants; providing a flow of an oxidizing processing gas to the chamber;

causing a reaction between the silicon-coning processing gas and the oxidizing processing gas to form a silicon oxide layer, col. 3, line 51 - col. 4, line 7; and

heating the substrate in the presence of nitrous oxide (N_2O) to a temperature greater than or equal to 1000° C: 700°C -1250°C, in a rapid thermal process for a duration from about 5 seconds to around three minutes: approximately 5-60 seconds, to anneal the deposited film, col. 4, lines 8-56;

limitations from claim 17, heating the substrate in the presence of nitrous oxide (N_2O) col. 3, line 51 - col. 4, line 7, in a furnace to a temperature in the range from about 750° C to about 1000° C, 700°C -1250°C, to anneal the deposited film, col. 4, lines 8-56. While Thakur does not use the term 'furnace', Thakur inherently contains the use as the Merriam-Webster Online dictionary defines 'furnace' as: "an enclosed structure in which heat is produced." Since Thakur uses an enclosed chamber with heat as evidenced above, the 'furnace' limitation is met;

limitations from claims 10, 19, the method of claims 9, 19, wherein:
providing a flow of a silicon-containing processing gas comprises providing a flow of tetraethylorthosilicate (TEOS); and
providing a flow of an oxidizing processing gas comprises providing a flow of ozone, col. 3, line 51 - col. 4, line 7;

limitations from claim 18, the method of claim 17, further comprising introducing steam into the furnace, col. 4, lines 8-17.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thakur as applied to claims 9, 10, 17-19 above, and further in view of Jang et al., US Patent No. 6,239,002 B1.

Thakur does not specify the details of the pressures or chamber temperature in deposition, but Jang does.

Jang teaches a method of forming a silicon oxide layer on a substrate, comprising:

in fig. 2, providing a flow of a silicon-containing processing gas to a chamber housing the substrate 10;

providing a flow of an oxidizing processing gas to the chamber, col. 7, lines 10-63;

causing a reaction between the silicon-containing processing gas and the oxidizing processing gas to form a silicon oxide layer 16; and

in fig. 3, heating the substrate in the presence of nitrous oxide 18 to a temperature greater than or equal to 1000°C in a rapid thermal process for a duration greater than or equal to 1 minute, col. 8, lines 12-33;

limitations from claims 11, the method of claim 9, wherein causing a reaction between the silicon-containing processing gas and the oxidizing gas comprises regulating the pressure of the chamber to sub-atmospheric levels, col. 7, lines 10-51;

limitations from claim 12, the method of claim 11, wherein the sub-atmospheric levels comprise pressures in a range from about 200 torr to less than about 760 torr, col. 7, lines 10-51;

limitations from claim 13, the method of claim 9, wherein causing a reaction between the silicon-containing processing gas and the oxidizing processing gas comprises regulating the temperature of the chamber to a range from about 400°C to about 570°C, col. 7, lines 52-63.

Jang gives motivation in col. 4, lines 3-11. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Jang's process with Thakur's invention would have been beneficial because it forms a film fill layer with enhanced gap filling properties.

Claims 20, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thakur in view of Jang.

Thakur teaches, limitations from claims 20, 23, in fig. 3, a method of forming a silicon oxide layer 26 on a substrate 10, comprising:

providing a flow of tetraethylorthosilicate (TEOS) processing gas to a chamber housing, not specified, but necessary to contain the reactants, the substrate,

providing a flow of ozone to the chamber, col. 3, line 51 - col. 4, line 7;

causing a reaction between the TEOS and the ozone to form a silicon oxide layer; and

heating the substrate in the presence of nitrous oxide to a temperature greater than or equal to 1000° C, 700°C -1250°C, in a rapid thermal process for a duration from about 5 seconds up to around three minutes to anneal the deposited film, approximately 5-60 seconds, col. 4, lines 8-56.

Thakur does not specify the details of the pressures or chamber temperature in deposition, but Jang does.

Jang teaches

a method of forming a silicon oxide layer on a substrate, comprising:

in fig. 2, providing a flow of a silicon-containing processing gas to a chamber housing the substrate 10;

providing a flow of an oxidizing processing gas to the chamber, col. 7, lines 10-63;

causing a reaction between the silicon-containing processing gas and the oxidizing processing gas to form a silicon oxide layer 16; and

in fig. 3, heating the substrate in the presence of nitrous oxide 18 to a temperature greater than or equal to 1000°C in a rapid thermal process for a duration greater than or equal to 1 minute, col. 8, lines 12-33;

regulating the pressure of the chamber to a pressure in a range from about 200 torr to less than about 760 torr, col. 7, lines 10-51.

Jang gives motivation in col. 4, lines 3-11. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Jang's process with Thakur's invention would have been beneficial because it forms a film fill layer with enhanced gap filling properties.

Allowable Subject Matter

Claims 1-6, 8 are allowed, for the reasons given in paper 29 September 2005.

Response to Arguments

Applicant's arguments filed 24 April 2006 have been fully considered but they are not persuasive. Applicant argues that the prior art of record (specifically Gabric) does not teach or suggest nitrous oxide annealing.

Examiner has found Thakur, which does teach nitrous oxide annealing.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William M. Brewster whose telephone number is 571-272-1854. The examiner can normally be reached on Full Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

William M. Brewster

WILLIAM M. BREWSTER
PRIMARY EXAMINER

16 May 2006
WB